

# HAMMER-TYPE STAPLER WITH CARTRIDGE

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a hammer-type stapler with cartridge and  
5 more particularly pertains to manually operated impact staplers in building, for  
striking staples into working piece, for example, thin board, blanket, or asphalt  
felt on the roof, and fix it.

### 2. Description of the Prior Art

The use of stapler is known in building. Hammer-type stapler is usually  
10 needed in the building site without electric power, like out door.

Known prior art includes U.S. Pat. No. 3,113,117; U.S. Pat. No. 6,012,623.

Two kinds of hammer-type staplers are as follow. Referring to Fig. 1 is a perspective view of the first kind of hammer-type stapler of prior art. By  
15 holding the handle 1001 and wielding the stapler to make the driving element  
guiding device 2001 to strike a target piece. Because of the force of inertia, the  
driving element 1101 will move in curving line with an axle center of the pin  
1002 (referring to Fig. 2). The driving element 1101 will strike the first staple  
2002 into the target piece.

20 However, the driving element 1101 does not strike the staples in a vertical  
line. It will increase the opportunity of jam (means the staple was jammed in  
the driving element guiding device 2001) because of the side-direction force.  
To clean a jam, first, remove the hook set 3002 from the end of the casing 100.  
Second, take out the press spring set 300, then pull the pin 1002. Lastly, take

out the staple containing set 200 from the front portion of the casing 100. After removing the jammed staple, install all the elements in reverse order. It takes so many steps and is very complicated. When installing the elements in reverse order, it is easy to miss an element, especially when working outdoor.

5 Referring to Fig. 3 is the second kind of hammer-type stapler of prior art. By holding the handle 400 and wielding the ahead striking hammer set 500 to strike a target piece. Because of the reacting force, the trip lever 600 which projected downward will move upward along the guiding groove 6001 of the trip lever 600 and push a control pin 5001. Referring to Fig. 4 – 5, is a  
10 perspective view of the striking hammer set of prior art. Because the control pin 5001 is fixed on the stapler pusher 5003, by applying the principle of lever, the control pin 5001, then, makes the stapler pusher 5003 move counterclockwise with a fulcrum of a rivet 5002. A tip 5004 formed at the front of the stapler pusher 5003 push a driving element 700 downward in a curving  
15 way, then the driving element 700 strikes a staple 701 and into a target piece. An elastic plate 5005 push the stapler pusher 5003 to the original position.

The second kind of stapler doesn't move vertically either. On the other hand, if a jam should occur, referring to figures 6A – 6D is the perspective view of the jam cleaning procedure of the second kind of prior art. First, as shown in  
20 the figure 6A, lift the handle lip 4001, then, pull the staple feeder spring 4002 and pusher 4003 to the back of the tool and disengage, and remove all unused staples to avoid the staples from shooting out when cleaning the jam. The second step, as shown in the figure 6B, disassembles the jaw release spring 800. Then, as shown in the figure 6C, the right hand holds the control pin 5001; the

left hand simultaneously holds the trip lever 600 and takes apart the control pin 5001. Finally, as shown in the figure 6D, slip off the front jaw 900 by pivoting it down and off from the back end. Then remove any jammed staples and carefully clean the tool.

5 This kind of stapler has the hidden danger of staple shooting out when cleaning the jam and on the other hand, it involves several jam cleaning procedure. In addition, the elements were exposed and had much seams, so sand may be deposited at its seams result in its breakdown.

In conclusion, the disadvantages of the prior staplers are as followed:

- 10 1. The movement of the driving element of the prior staplers is in a curving way and not in a vertical way. It produces a lateral force besides the vertical force, so that it easily leads to a staple jamming.
2. When cleaning the jammed staples of the prior staplers, the cleaning procedure involves much time, reducing the working efficiency.
- 15 3. The prior staplers include many metal elements and many connecting procedures between those elements. Much time and high cost are needed for its production.
4. The prior staplers were limited to use staple of specific size or type, it could not use different size of staples. Due to different factory brand, those staples may have a 5mm difference in width, causing the staples to jam, even damaging to the tool and seriously injury to the user or others in the work area with the staple fragments.

## SUMMARY OF THE INVENTION

The general purpose of the present invention is to provide a new hammer-type stapler with cartridge, which has a device driving the staples vertically to guide the striking force on the staples efficiently without any other 5 non-vertical force for reducing the opportunity of jam.

Another purpose of the present invention is to provide a design of replaceable cartridges. Such replaceable cartridge can simplify the steps of loading staples and cleaning jammed staples, also, it is safe and quickly.

The present invention was made of a lot of plastic material and simplifies 10 the steps of manufacturing to enable the assembly line to be fast and to drop the cost of manufacturing. Moreover, it is a close module that will not be deposited with sand, prolonging its useful life.

Even better, the present invention can use the same stapler to load various wide staples by using another embodiment of a cartridge for various wide 15 staples, which could load various wide staples.

In view of the foregoing disadvantages inherent in the known types of staplers now present in the prior art, another hammer tool is needed for staples which have been driven improperly, the present invention provides one more function as a hammer mounting a metal hammering plate on the top of the 20 stapler.

To attain this, the present invention, a new hammer-type stapler with cartridge for driving a staple into a target piece, generally comprises a casing having a front portion and a handle connected with a distal end of the front portion, a hollow hammer casing extended from an opposing end of the front

portion, a driving unit vertically mounted in the hammer casing for driving the staple with a vertical action, a replaceable cartridge installed in the front portion, a pushing device slidably mounted in the handle for pushing the staple in the cartridge to a driven position, and a metal hammering plate mounted on a 5 top of the hammer casing whereby the stapler with a function of being a hammer.

These together with other objects of the invention, along with the various features of novelty which characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For 10 a better understanding of the invention, its operating advantages and the specific objects attained by it uses, reference should be made to the accompanying drawing and descriptive matter in which there are illustrated preferred embodiments of the invention.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

15 The invention will be better understood and objects other than those set forth above will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

20 FIG. 1 is a perspective view of the first kind of hammer-type staplers of prior art.

FIG. 2 is a perspective view of the first kind of prior hammer-type staplers when striking a staple.

FIG. 3 is a schematic perspective view of the second kind of hammer-type staplers of prior art.

FIG. 4 is a perspective view of the striking hammer set of the second kind of prior art.

FIG. 5 is a perspective view of the striking hammer set of the second kind of prior art.

5 FIG. 6A to 6D is a perspective view of the jam cleaning procedure view of the second kind of prior art.

FIG. 7 is an exploded view of a new hammer-type stapler with cartridge according to the present invention.

FIG. 8 is an exploded view of the pushing device of the present invention.

10 FIG. 9 is a schematic cross-sectional view along line 9-9 of the present invention.

FIG. 10 is an assembled schematic view of the present invention.

FIG. 11 is an exploded view of the cartridge for various wide staples.

15 FIG. 12 is a perspective view of the stapler holder of the second embodiment of the present invention.

FIG. 13 is a perspective view of the vertical wall of the hammer casing of the second embodiment of the present invention.

FIG. 14A to 14G is a schematic view of replacing the cartridge of the present invention.

## 20 **DESCRIPTION OF THE PREFERRED EMBODIMENT**

With referring now to the drawings, and in particular to figure 7, an exploded view of a new hammer-type stapler with cartridge according to the present invention comprises a casing 1, a driving unit 2, a cartridge 3 and a pushing device 4. The casing 1 is an integral casing having a front portion 12 and

handle 13 connected with a distal end of the front portion 12, a hollow hammer casing 11 extended from an opposing end of the front portion 12. A striking unit 2 vertically mounted in the hammer casing 11. The hammer casing 11 has a front wall 112, a back wall 113, two opposing side walls 114 and an upper opening 111. A plurality of protrusion 1140 formed on an inner surface of each opposing side walls 114. The front portion 12 has a top wall 121, two opposing side walls 122 and a lower opening 123. The top wall 121 connects with the back wall 113 of the hammer casing 11 and forms a horizontal shock-shearing groove 115 thereon for reducing the vibration resulted from the working. The side walls 122 of the front portion 12 connects with the side walls 114 of the hammer casing 11 and forms a cartridge-taking opening 124 thereon adjacent to the opening 123 for taking out the cartridge 3 conveniently. The handle 13 could be covered with a coat of soft material for a comfortable hold and for absorbing vibration, and has a top wall 131, a lower wall 132 and two opposing side walls 133. A distal end of the handle 13 formed a distal opening 14 for slidably mounted the pushing device 4 therein. The cartridge 3 was installed into the front portion 12 from the distal opening 14. The pushing device 4 pierces into and props up the cartridge 3, also pushes forward the staples therein. A hammering plate 20 made of metal mounted on the upper opening 111 of the hammer casing 11 increasing the stapler's function as a hammer.

The driving unit 2 includes a weight-containing seat, an U-shaped seat 21, including a top wall 211 and two opposing side walls 211 and formed a concave space, the top wall 211 connected with a bottom of the hammering plate 20 and formed at least one connecting hole, in this embodiment is a pair

of connecting holes 210 for connecting at least one weight-guiding device. The weight-guiding device can be a metal plate or a metal casing (not shown), in this embodiment is a pair of weight-guiding rods 24 connected to the connecting holes 210 of U-shaped seat 21; a cushion 22 slidably mounted on 5 the weight-guiding rod 24 with holes 221 and adhered to the top wall 211 of the U-shaped seat 21; a weight 23 slidably mounted on the weight-guiding rods 24 with a pair of through holes 231; an elastic element, in this embodiment is a pair of recoil springs 25 under the weight 23 and slidably mounted on the weight-guiding rods 24; a bottom plate, in this embodiment is a guiding-rod 10 fixed plate 26 soldered on a distal end of the weight-guiding rods 24; and a driving element 27 screwed onto the weight 23 with screws 28. The recoil springs 25 located between the weight 23 and the guiding-rod fixed plate 26 for providing a recoiling force to the weight 23. The side walls 212 of the U-shaped seat 21 formed a plurality of concave holes 213 for engaging with the 15 protrusions 1140 of hammer casing 11, thus, the driving unit 2 could be engaged on the hammer casing 11. A bracket 30 adjacent to the driving element 27 has two vertical side plates respectively formed on two ends of the bracket 30 for connecting to the side walls 114 of the hammer casing 11 and holding the cartridge 3.

20 The cartridge 3 is composed of two symmetrical, upper and lower staple containers 31, which are opposite in direction, and with respective outstanding portion at opposite ends. The staple containers 31 respectively protrude two parallel tracks 311 from each opposite top surface therein defining an E-shaped groove 312 for allowing staples 32 and a staple pusher 33 to slide on. To

prevent the staple pusher 33 from slipping off the staple container 31, a sealer 313 formed on an end of the staple container 31 with a tool, for example, a heated soldering iron. The staple pusher 33 has a staple-like shell 331 and a block 332 protruding from an internal bottom surface of the staple-like shell 331. The block 332 is pushed by the pushing device 4 that pushes the staples 32 forward. Another end of the staple container 31 has a staple-outlet 34, which is mounted with a steel pad 35 for protecting the cartridge 3 against cutting and abrasion from the driving element 27. The length of the block 332 and of steel pad 35 coordinated each other so as not to let the staple pusher 33 project out of the staple-outlet 34.

To match up the two ends of the cartridges, a cartridge matching unit, a guiding plate 29 for the driving element 27 is embedded in the internal surface of the front wall 112 of the hammer casing 11 for guiding the driving element 27 to smoothly move up and down.

The pushing device 4 comprises a pushing-device casing 41 mounted with a securing unit 44 on a distal end thereof, a spring pushing unit 43 affixed in the pushing-device casing 41 with a pin 45, and a cartridge holder 42 slidably mounted on the pushing device 4. A horizontal groove 411 is formed on a lateral surface of the pushing-device casing 41 with an end 4111 so as not to cross the lateral surface. A pin 412 is inserted into a lateral surface of the handle 13 corresponding to the horizontal groove 411, so that the pushing device 4 can slide in the handle 13 and not apart the casing 1 with the affixed pin 412. The cartridge holder 42 slides in the casing 1 with a pin 420 for supporting the cartridge 3.

Referring FIGS. 8 and 9, FIG 8 is an explode view of the pushing device 4 and figure 9 is a cross-sectional view according to line 9-9 in figure 8, a sidelong opening 416 formed on a distal end of the pushing-device casing 41 with an upper board 417 and lower board 418. The upper board 417 has a 5 locking hole 4170 in the center inserted with a lock pin 4171, the lock pin 4171 formed a lateral opening 4173 crossed with a pin 4172 which crossed the upper board 417, so that the lock pin 417 affixed in the upper board 417. A spring 4174 is mounted under the lock pin 417 and on the lower board 418. The upper board 417 connects an upper pressing apparatus 441, the lower board 418 10 connects a lower pressing apparatus 442, and a spring 4175 mounted between the upper pressing apparatus 441 and lower pressing apparatus 442. A locking hole 4176 formed on the internal surface of the upper wall 131 of the handle 13 corresponding with the lock pin 417, when the pushing device 4 is pushed to the bottom, the lock pin 417 can be engaged into the locking hole 4176, so that 15 the pushing device 4 can lock on the handle 13. An end of the pushing-device casing 41 opposite the sidelong opening 416 formed a spring chamber 414 for containing the spring pushing unit 43, and an empty groove 415 above the spring chamber 414 for reducing the weight.

The cartridge holder 42 comprises a holding flange 421 extended thereon 20 in horizontal direction, a penetrating hole 422 formed therein to let the spring pushing unit 43 pass through, and a sliding groove 423 crosscutting therein and vertical to the penetrating hole 422 with a pin 420 penetrated into it, so that the cartridge holder 42 can slide within the side walls 122 behind the cartridge-taking opening 124.

The spring pushing unit 43 comprises a spring 431, a front rod 432 and a rear rod 433. The front rod 432 has a pushing end 434 at a distal end for pushing the staple pusher 33 in the cartridge 3, and a wedging block 435 formed at another distal end. The rear rod 433 has a guiding ring 436 in a distal 5 end that is smaller than the wedging block 435 seizing it. The front rod 432 slipped in the guiding ring 436, forming an adjustable guiding rod. The rear rod 433 has a locking hole 437 formed at another end, which affixed at a distal end of the spring chamber 414 of the pushing-device casing 41 with a pin 45. The spring 431 has been compressed and mounted between the pushing end 434 10 and the locking hole 437.

Referring to figure 10, it is an assembled schematic view of the present invention. Moreover, we can apply the microcellular foam injection molding processing technology to the casing of the present invention. The process uses foaming agent or inert gases, typically nitrogen or carbon dioxide, to create 15 evenly distributed and uniformly-sized microscopic cells throughout a polymer. The gas is injected into the polymer melt and mixed in supercritical condition. The plastics-gas mixture is injected into the injection molding tool, where it forms small, finely distributed gas bubbles such as cellular structure via the air diffusing action to the plastic material. The functions that can be achieved are 20 as follow:

1. Reduces the weight of the finished products, and intensifies the intensity of structure of each unit volume or weight.
2. The microscopic gas bubbles can absorb the vibration of the stapler while striking, the vibration conveyed to the handle would be reduced

much, lessening the tiredness of hand.

In view of the forgoing disadvantages inherent in the known types of staplers that can only use a specific size of staple, the present invention provides a cartridge for various wide staple, as shown in figure 11. The 5 cartridge for various wide staple 3' is composed of two identical, upper and lower staple containers 31', which are opposite in direction up and down, left and right of each other. The staple containers 31' respectively protrude two parallel tracks 311' from each opposite top surface therein defining an E-shaped groove 312' for allowing staples 32' and the staple pusher 33 to slide on. The 10 staple pusher 33 is the same in two embodiments of cartridge that also has the staple-like shell 331 and the block 332. To prevent the staple pusher 33' from slipping off the staple container 31', a sealer 313' forms on the end of the staple container 31' with a tool, for example, a heated soldering iron. The block 332 is pushed by the pushing device 4 that pushes the staples 32' forward. Another 15 end of the staple container 31' has a staple-outlet 34' mounted with a steel pad 35' for protecting the cartridge 3' against cutting and abrasion from the driving element 27. The length of the block 332 and of steel pad 35' coordinated each other so as not to let the staple pusher 33 project out of the staple-outlet 34'. The staples 32' are loaded into the cartridge 3' from the staple-outlet 34'. A 20 metal covering 36' pivoted on the upper part of the staple-outlet 34', including two lateral surfaces 361' respectively bended from the two side distal portion of the metal covering 36', a front hood 362' is formed between the two lateral surfaces 361' which is adjacent to the staple-outlet 34', and an upper opening 363' is formed above the front hood 362'; whereby exactly guiding the driving

element 27 to drive staples, and prevents staples 32' from slipping off the staple-outlet 34'. The front hood 362' has two protruding ears 364' respectively formed on the distal end of the lateral surfaces 361', to conveniently open the metal covering 36'. By analyzing all the staple kinds of different factories, 5 those staples differ in about 5mm in width, by setting the width of the lateral surfaces 361' adapted to different staples, the cartridge for various wide staple 3' can accommodate staples of different width. Hence, the new hammer-type stapler can load different staples by using different cartridge 3'.

Referring to figure 12, is another embodiment of the cartridge holder 42' 10 according to the cartridge for various wide staple 3'. The cartridge holder 42' has a holding flange, it could be a metal plate 424', extended in the horizontal direction and affixed on the bottom surface thereof for holding the cartridge 3', a penetrating hole 422' formed therein to let the spring pushing unit 43 pass through, and a sliding groove 423' crosscutting therein and vertical to the 15 penetrating hole 422' with a pin 420 penetrated into it, so that the cartridge holder 42' can slide within the side walls 122 behind the cartridge-taking opening 124.

Referring to figure 13, a cartridge matching unit corresponding to the front portion of the cartridge for various wide staple 3', a concave 1121 is formed on 20 the internal surface of the front wall 112 of the hammer casing 11. The concave 1121 is approximately U-shaped and the depth thereof is about the thickness of the metal covering 36', so that it can match the metal covering 36' and guide the driving element 27 to slide forward along the front wall 112 and into the metal covering 36'.

Referring to figures 14A to 14G, showing how to replace the cartridge of the present invention. Press the securing unit 44, as shown in figure 14A. Pull out the pushing-device casing 41, as shown in figure 14B. Pull the cartridge from the cartridge-taking opening 124, as shown in figure 14C. Drag out the 5 cartridge downward, as shown in figure 14D. If during a drive stroke, a staple got jammed, it can be removed at this time. Rotate the cartridge in reverse, as shown in figure 14E. Through the lower opening 123 of the casing 1, plug the cartridge obliquely into the hammer casing 11, and push it into the front portion 12 from the cartridge-taking opening 124, as shown in figure 14F. Push the 10 pushing-device casing 41 into the handle 13 until it is locked with the handle, as shown in figure 14G.

The sum up of the characters and advantages are as follow:

1. The present invention provides a device, which can drive staples vertically to guide the striking force on the staples efficiently without other 15 non-vertical force for reducing the opportunity of jam.
2. The mass of material used in the present invention is plastic, and simplifies the steps of manufacturing to enable the assembly line to be fast and to drop the cost of manufacturing. Moreover, it is a closed module that will not be deposited with sand, prolonging its useful life.
- 20 3. The present invention provides the cartridge for various wide staples, which could load various wide staples, so that can use the same stapler can be used to load various wide staples replaceable cartridges. The practicality is advanced.
4. The present invention provides one more function as a hammer with a

mounted metal hammering plate on top of the hammer casing, it doesn't need to carry another hammer tool for dealing with the staples which have been driven improperly.

Those skilled in the art will readily observe that numerous modification 5 and alterations of the device can be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.